Understanding Texture Evolution During Tribological Loading of Austenitic Stainless Steel

CATEGORY OR KEYWORDS
Materials Tribology, Wear of materials

AUTHORS AND INSTITUTIONS
Piyush Patil[a], Gerhard Dehm[a], Steffen Brinckmann[a];
[a]Max Planck Institut für Eisenforschung, Düsseldorf

INTRODUCTION
Wear of materials leads to higher economic costs, improving the wear resistance, would improve the life time of components, reduce the service costs as well as energy consumption.

ABSTRACT
Wear of materials lead to higher energy consumption which in turn leads to higher economic as well as environmental costs. Engineering materials with higher wear resistence can significantly reduce the costs to overcome wear and friction. Wear properties of a metal is largely dependent on its microstructure. During tribological loading, structural changes in the subsurface of the metal is observed which leads to change in the microstructure near the surface of the metal. Formation of small grains has been observed in ductile metals in the past [1] but its quantitative description is still at large. Grain refinement plays an important role in the minimization of wear-rate as the fine grained microstructure has higher hardness. To understand mechanism of the grain refinement and texture development quantitatively, we employ scratching experiments on different grain orientations with varying loads using Nanoindenter with diamond tip. Multiple samples of austenitic stainless steel are prepared by conventional metallographic preparation. The grain orientation and grain size is determined by Electron Backscatter Diffraction (EBSD) in a Scanning Electron Microscope (SEM). The wear tracks will be performed with varying force and velocity. To observe subsurface plasticity, cross-sections from the wear track are produced by Focused Ion Beam (FIB) milling and are characterized by Transmission Kikuchi Diffraction (TKD) in the SEM.

Preliminary results show (Figure 1) that the misorientation increases linearly from bulk to surface which correlates to dislocation density of 2.10^{13} cm^{-2}.

Figure 1: Cross-section of the wear track (scratch direction is perpendicular to the plane of view)

REFERENCES
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